

1 CLAIMS

2 I claim:

3 <sup>23</sup> 1. ~~A yieldable cushioning element comprising:~~

4 a quantity of gel cushioning media formed to have a top, a  
5 bottom, and an outer periphery, the cushioning media being  
6 compressible so that it will deform under the compressive force  
7 of a cushioned object, and

8 a plurality of hollow columns situated in said cushioning  
9 media, each of said columns having a longitudinal axis along its  
10 length, each of said columns having a column wall which defines a  
11 column interior, and each of said columns having a column top and  
12 a column bottom;

13 wherein the cushioning element is adapted to have a cushioned  
14 object placed in contact with said cushioning element top;

15 wherein the column top and the column bottom of one of said  
16 columns are located at two different points on said longitudinal  
17 axis of said column;

18 wherein said column's longitudinal axis is located generally  
19 parallel to the direction of a compressive force exerted on the  
20 cushioning element by a cushioned object in contact with said  
21 column top;

22 wherein at least one of said column walls is capable of  
23 buckling beneath a protuberance that is located on a cushioned  
24 object; and

1 wherein the cushioning element is yieldable as a result of  
2 compressibility of said cushioning media and bucklability of said  
3 column.

4 2. A cushioning element as recited in claim 1 wherein in  
5 at least one of said columns, said column top is open to said  
6 column interior.

7 3. A cushioning element as recited in claim 1 wherein in  
8 at least one of said columns, said column bottom is open to said  
9 column interior.

10 ~~3. A cushioning element as recited in claim 1 wherein in~~  
11 ~~at least one of said columns, both said column top and said~~  
12 ~~column bottom are open to said column interior.~~

13 4. A cushioning element as recited in claim 3 wherein said  
14 column interior is hollow so that air may pass through said column  
15 to said column top in order to ventilate a cushioned object in  
16 contact with said top of the cushioning element.

17 5. A cushioning element as recited in claim 1 wherein said  
18 gel cushioning media is selected from the group consisting of  
19 gelatinous elastomers and gelatinous viscoelastomers.

1        6.        A cushioning element as recited in claim 1 wherein said  
2 gel is non-flowable at normal usable temperatures of the  
3 cushioning element.

4        7.        A cushioning element as recited in claim 1 wherein said  
5 gel cushioning media does not escape from a puncture on said  
6 cushioning element.

7        <sup>6</sup>  
8.        A cushioning element as recited in claim 1, wherein a  
8 cross section of one of said columns taken orthogonal to said  
9 longitudinal axis of said column has a shape selected from the  
10 group consisting of triangular, square, rectangular, pentagonal,  
11 heptagonal, octagonal, round, oval, and n-sided polygonal where n  
12 is an integer.

13        <sup>7</sup>  
8.        A cushioning element as recited in claim 1, wherein a  
14 cross section of one of said columns taken orthogonal to said  
15 longitudinal axis of said column is hexagonal.

16        <sup>8</sup>  
10.        A cushioning element as recited in claim 1 wherein said  
17 cushioning element has shape memory so that when a cushioned  
18 object is removed from contact with the cushioning element, the  
19 cushioning element has a tendency to return to a shape that  
20 approximates the shape of the cushioning element before the

1 cushioning element and the cushioned object came into contact  
2 with each other.

3 <sup>9</sup>  
~~11~~. A cushioning element as recited in claim 1 wherein said  
4 gel cushioning element is configured to have a low overall  
5 thermal mass and a low rate of thermal transfer in order to  
6 provide a comfortable cushioning element.

7 <sup>10</sup>  
~~12~~. A cushioning element as recited in claim 1 wherein said  
8 periphery of the cushioning element has a shape selected from the  
9 group consisting of triangular, square, rectangular, pentagonal,  
10 hexagonal, heptagonal, octagonal, round, oval, elliptical, heart-  
11 shaped, and n-sided polygonal.

12 <sup>11</sup>  
~~13~~. A cushioning element as recited in claim 1 wherein said  
13 cushioning media includes a quantity of gas bubbles within it,  
14 said gas bubbles serving to increase the compressibility of the  
15 cushioning element.

16 <sup>12</sup>  
~~14~~. A cushioning element as recited in claim <sup>11</sup>~~13~~ wherein  
17 said gas bubbles are dispersed throughout said cushioning media  
18 of the cushioning element.

19 <sup>13</sup>  
~~15~~. A cushioning element as recited in claim <sup>11</sup>~~13~~ wherein a  
20 plurality of said gas bubbles are present in said column walls,

1 said gas bubbles in said column walls serving to decrease the  
2 level of compressive force required to be exerted on a column in  
3 order to cause the column to buckle.

4 <sup>14</sup>~~18~~. A cushioning element as recited in claim 1 wherein a  
5 plurality of said column walls have openings in them to permit  
6 movement of a liquid or gas between adjacent columns.

7 <sup>15</sup>~~17~~. A cushioning element as recited in claim 1 wherein at  
8 least one of said columns has a column interior that has a  
9 greater radial measurement orthogonal to the longitudinal axis of  
10 that column at a first point on the longitudinal axis of the  
11 column than at a second point on said longitudinal axis.

12 <sup>16</sup>~~18~~. A cushioning element as recited in claim <sup>15</sup>~~17~~ wherein  
13 said column is tapered between said column top and said column  
14 bottom.

15 <sup>17</sup>~~19~~. A cushioning element as recited in claim <sup>15</sup>~~17~~ wherein  
16 said column is stepped between said column top and said column  
17 bottom.

18 <sup>18</sup>~~20~~. A cushioning element as recited in claim 1 wherein in  
19 at least one column, said column top and said column bottom are

1 sealed so that said column interior is not in fluid or air  
2 communication with a region outside of said column interior.

3 <sup>19</sup>~~21~~. A cushioning element as recited in claim <sup>18</sup>~~20~~ wherein  
4 said column interior includes a quantity of fluid cushioning  
5 media within it.

6 <sup>20</sup>~~22~~. A cushioning element as recited in claim 1 wherein at  
7 least one of said columns has a column interior that contains a  
8 quantity of foam within it, said foam being selected from the  
9 group consisting of open cell foam and closed cell foam.

10 <sup>21</sup>~~23~~. A cushioning element as recited in claim 1 wherein at  
11 least one of said columns has a firmness protrusion located at  
12 its column bottom, said firmness protrusion being adapted to  
13 provide support within said column when said column buckles so  
14 that the cushioning element can readily yield in the vicinity of  
15 said column under a cushioned object until the cushioned object  
16 begins to compress said firmness protrusion, whereupon said  
17 firmness protrusion retards further movement of the cushioned  
18 object into the cushioning element.

19 <sup>22</sup>~~24~~. A cushioning element as recited in claim 1 wherein at  
20 least one of said columns is adapted to buckle by having a

1 portion of its column wall bulge outward away from the column  
2 interior.

3 <sup>23</sup>  
~~25.~~ A cushioning element as recited in claim 1 wherein at  
4 least one of said columns is adapted to buckle by having a  
5 portion of its column wall bulge inward toward the column  
6 interior.

7 <sup>24</sup>  
~~26.~~ A cushioning element as recited in claim 1 wherein at  
8 least one of said columns is adapted to yield along its  
9 longitudinal axis by buckling of its column wall.

10 <sup>25</sup>  
~~27.~~ A cushioning element as recited in claim 1, wherein the  
11 cushioning element has a total volume contained within the  
12 boundaries of the cushioning element top, bottom and outer  
13 periphery; and wherein said cushioning element total volume is  
14 occupied by not more than about 50% by volume of cushioning  
15 media.

16 <sup>26</sup>  
~~28.~~ A cushioning element as recited in claim 1 wherein said  
17 gel cushioning media is selected from the group consisting of  
18 elastomers and viscoelastomers.

19 <sup>27</sup>  
~~29.~~ A cushioning element as recited in claim <sup>26</sup>~~28~~ wherein  
20 said gel cushioning media has a Shore A hardness of less than 15.

1        <sup>28</sup>  
28.        A cushioning element as recited in claim <sup>26</sup>~~28~~ wherein  
2        said gel cushioning media has a Shore A hardness of less than 3.

3        <sup>29</sup>  
~~31.~~        A cushioning element as recited in claim <sup>26</sup>~~28~~ wherein  
4        said gel cushioning media has a gram Bloom of less than 800.

5        <sup>30</sup>  
~~32.~~        A cushioning element as recited in claim <sup>26</sup>~~28~~ wherein  
6        said gel cushioning media comprises a high viscosity triblock  
7        copolymer.

8        <sup>31</sup>  
~~33.~~        A cushioning element as recited in claim <sup>30</sup>~~32~~ wherein  
9        said copolymer has the general configuration of poly(styrene-  
10        ethylene-butylene-styrene).

11        <sup>32</sup>  
~~34.~~        A cushioning element as recited in claim <sup>26</sup>~~28~~ wherein  
12        said gel cushioning media comprises about 100 parts by weight of  
13        a triblock copolymer and from about 200 to about 1600 parts by  
14        weight of a plasticizing oil.

15        <sup>33</sup>  
~~35.~~        A cushioning element as recited in claim <sup>32</sup>~~34~~ wherein  
16        said copolymer has the general configuration of poly(styrene-  
17        ethylene-butylene-styrene).

18 <sup>34</sup>  
~~36.~~        ~~A yieldable cushion comprising:~~  
             <sup>24</sup>



1 a cushioning element having a top, a bottom, a center and a  
2 side wall, said cushioning element comprising a quantity of  
3 gelatinous cushioning media and a plurality of contiguous,  
4 adjacent hollow columns located within said cushioning media,  
5 said columns each having a column interior and a column wall,

6 a base configured to be placed in contact with said cushioning  
7 element bottom, said base being rigid in order to provide support  
8 beneath said cushioning element when a cushioned object is in  
9 contact with the cushion such that a compressive force is exerted  
10 against said cushioning element top by the cushioned object, and

11 a side wall support, said side wall support being configured to  
12 tend to constrain said side wall of said cushioning element from  
13 moving outward from said cushioning element center;

14 wherein said cushion is yieldable in response to a compressive  
15 force exerted upon it by a cushioned object; and

16 wherein said yieldability of the cushion results from said  
17 cushioning media being compressible and from said columns being  
18 bucklable, so that the cushion is able to substantially conform  
19 to the shape of a cushioned object.

20 <sup>35</sup>  
37. A cushion as recited in claim <sup>34</sup>~~36~~ wherein in at least  
21 one of said columns, said column top is open to said column  
22 interior.

1 <sup>36</sup>~~38~~. A cushion as recited in claim <sup>34</sup>~~36~~ wherein in at least  
2 one of said columns, said column bottom is open to said column  
3 interior.

4 <sup>37</sup>~~39~~. A cushion as recited in claim <sup>34</sup>~~36~~ wherein in at least  
5 one of said columns, both said column top and said column bottom  
6 are open to said column interior.

7 <sup>38</sup>~~40~~. A cushion as recited in claim <sup>37</sup>~~39~~ wherein said column  
8 interior is hollow so that air may pass though said column to  
9 said column top in order to ventilate a cushioned object in  
10 contact with said top of the cushioning element.

11 <sup>39</sup>~~41~~. A cushion as recited in claim <sup>34</sup>~~36~~ wherein said gel  
12 cushioning media is selected from the group consisting of  
13 gelatinous elastomers and gelatinous viscoelastomers.

14 42. A cushion as recited in claim 36 wherein said gel is  
15 non-flowable at normal usable temperatures of the cushioning  
16 element.

17 ~~43. A cushion as recited in claim 37 wherein said gel~~  
18 ~~cushioning media does not escape from a puncture on said~~  
19 ~~cushioning element.~~

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1 ~~44~~. A cushion as recited in claim ~~36~~, wherein a cross  
2 section of one of said columns taken orthogonal to said  
3 longitudinal axis of said column has a shape selected from the  
4 group consisting of triangular, square, rectangular, pentagonal,  
5 heptagonal, octagonal, round, oval, and n-sided polygonal where n  
6 is an integer.

7 45. A cushion as recited in claim ~~36~~ wherein said  
8 cushioning element has shape memory so that when a cushioned  
9 object is removed from contact with the cushioning element, the  
10 cushioning element has a tendency to return to a shape that  
11 approximates the shape of the cushioning element before the  
12 cushioning element and the cushioned object came into contact  
13 with each other.

41 ~~44~~

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14 ~~46~~. A cushion as recited in claim ~~36~~ wherein said gel  
15 cushioning element is configured to have a low overall thermal  
16 mass and a low overall rate of thermal transfer in order to  
17 provide a comfortable cushioning element.

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18 ~~47~~. A cushion as recited in claim ~~36~~ wherein said periphery  
19 of the cushioning element has a shape selected from the group  
20 consisting of triangular, square, rectangular, pentagonal,  
21 hexagonal, heptagonal, octagonal, round, oval, elliptical, heart-  
22 shaped, and n-sided polygonal.

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A cushion as recited in claim ~~36~~ wherein said cushioning media includes a quantity of gas bubbles within it, said gas bubbles serving to enhance the compressibility of the cushioning element.

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A cushion as recited in claim ~~48~~ wherein said gas bubbles are dispersed throughout said cushioning media of the cushioning element.

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A cushion as recited in claim ~~49~~ wherein a plurality of said gas bubbles are present in said column walls, said gas bubbles in said column walls serving to decrease the level of compressive force required to be exerted on a column in order to cause the column to buckle.

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A cushion as recited in claim ~~36~~ wherein a plurality of said column walls have openings in them to permit movement of a liquid or gas between adjacent columns.

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A cushion as recited in claim ~~36~~ wherein at least one of said columns has a column interior that has a greater radial measurement orthogonal to the longitudinal axis of that column at a first point on the longitudinal axis of the column than at a second point on said longitudinal axis.

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1 ~~53.~~ A cushion as recited in claim ~~52~~<sup>47</sup> wherein said column is  
2 tapered between said column top and said column bottom.

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3 ~~54.~~ A cushion as recited in claim ~~53~~<sup>48</sup> wherein said column is  
4 stepped between said column top and said column bottom.

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5 ~~55.~~ A cushion as recited in claim ~~36~~<sup>34</sup> wherein in at least  
6 one column, said column top and said column bottom are sealed so  
7 that said column interior is not in fluid or air communication  
8 with a region outside of said column interior.

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9 ~~56.~~ A cushion as recited in claim ~~55~~ wherein said column  
10 interior includes a quantity of fluid cushioning media within it.

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11 ~~57.~~ A cushion as recited in claim ~~36~~ wherein at least one  
12 of said columns has a column interior that contains a quantity of  
13 foam within it, said foam being selected from the group  
14 consisting of open cell foam and closed cell foam.

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15 ~~58.~~ A cushion as recited in claim ~~36~~ wherein at least one  
16 of said columns has a firmness protrusion located at its column  
17 bottom, said firmness protrusion being adapted to provide support  
18 within said column when said column buckles so that the  
19 cushioning element can readily yield in the vicinity of said  
20 column under a cushioned object until the cushioned object begins

1 to compress said firmness protrusion, whereupon said firmness  
2 protrusion retards further movement of the cushioned object into  
3 the cushioning element.

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4 59. A cushion as recited in claim 34 wherein at least one  
5 of said columns is adapted to buckle by having a portion of its  
6 column wall bulge outward away from the column interior.

55  
7 60. A cushion as recited in claim 34 wherein at least one  
8 of said columns is adapted to buckle by having a portion of its  
9 column wall bulge inward toward the column interior.

56  
10 61. A cushion as recited in claim 34 wherein at least one  
11 of said columns is adapted to yield along its longitudinal axis  
12 by buckling of its column wall.

57  
13 62. A cushion as recited in claim 34, wherein the  
14 cushioning element has a total volume contained within the  
15 boundaries of the cushioning element top, bottom and outer  
16 periphery; and wherein said cushioning element total volume is  
17 occupied by not more than about 50% by volume of cushioning  
18 media.

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1 A cushion as recited in claim ~~36~~ wherein said  
2 gelatinous cushioning media is selected from the group consisting  
3 of gelatinous elastomers and viscoelastomers.

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4 A cushion as recited in claim ~~36~~ wherein said gel  
5 cushioning media has a Shore A hardness of less than 15.

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~~65~~

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6 A cushion as recited in claim ~~36~~ wherein said gel  
7 cushioning media has a Shore A hardness of less than 3.

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~~66~~

34

8 A cushion as recited in claim ~~36~~ wherein said gel  
9 cushioning media has a gram Bloom of less than 800.

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~~67~~

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10 A cushion as recited in claim ~~36~~ wherein said gel  
11 cushioning media comprises a high viscosity triblock copolymer.

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~~68~~

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12 A cushion as recited in claim ~~67~~ wherein said copolymer  
13 has the general configuration of poly(styrene-ethylene-butylene-  
14 styrene).

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~~69~~

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15 A cushion as recited in claim ~~36~~ wherein said gel  
16 cushioning media comprises about 100 parts by weight of a  
17 triblock copolymer and from about 200 to about 1600 parts by  
18 weight of a plasticizing oil.

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69  
B 1 78. A cushion as recited in claim 72 wherein said copolymer  
2 has the general configuration of poly(styrene-ethylene-butylene-  
3 styrene).

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71. <sup>as</sup> ~~A yieldable cushion comprising:~~

5 a cushioning element having a top, a bottom, a center and an  
6 outer periphery, said cushioning element comprising a quantity of  
7 gelatinous cushioning media and a plurality of columns located  
8 within said cushioning media, said columns each having a  
9 longitudinal axis, a column interior and a column wall,  
10 a container in which said cushioning element is placeable, said  
11 container having a container base configured to be in contact  
12 with said cushioning element bottom, said base being rigid in  
13 order to provide support beneath said cushioning element when a  
14 cushioned object is in contact with the cushion such that a  
15 compressive force is exerted against said cushioning element top  
16 by the cushioned object, said container also having a rigid outer  
17 periphery support, said rigid outer periphery support being  
18 configured to provide support to said cushioning element outer  
19 periphery in order to impede its tendency to move outward away  
20 from said cushioning element center when a cushioned object  
21 exerts a compressive force on the cushion,

add B' 7  
22 72. ~~A cushion as recited in claim 71~~



1 wherein said cushion is yieldable in response to a compressive  
2 force exerted upon it by a cushioned object; and

3 wherein said yieldability of the cushion results from said  
4 cushioning media being compressible and from said columns being  
5 bucklable generally in the direction of their longitudinal axes,  
6 so that the cushion is able to substantially conform to the shape  
7 of a cushioned object.

B 8 <sup>67</sup>  
~~73.~~ A cushion as recited in claim <sup>72</sup> ~~72~~ wherein in at least  
9 one of said columns, said column top is open to said column  
10 interior.

B 11 <sup>68</sup>  
~~74.~~ A cushion as recited in claim <sup>72</sup> ~~72~~ wherein in at least  
12 one of said columns, said column bottom is open to said column  
13 interior.

B 14 <sup>69</sup>  
~~75.~~ A cushion as recited in claim <sup>72</sup> ~~72~~ wherein in at least  
15 one of said columns, both said column top and said column bottom  
16 are open to said column interior.

17 <sup>70</sup>  
~~76.~~ A cushion as recited in claim <sup>69</sup> ~~75~~ wherein said column  
18 interior is hollow so that air may pass through said column to  
19 said column top in order to ventilate a cushioned object in  
20 contact with said top of the cushioning element.

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1 72. A cushion as recited in claim 72 wherein said gel  
2 cushioning media is selected from the group consisting of  
3 gelatinous elastomers and gelatinous viscoelastomers.

4 78. A cushion as recited in claim 72 wherein said gel is  
5 non-flowable at normal usable temperatures of the cushioning  
6 element.

7 ~~79. A cushion as recited in claim 73 wherein said gel~~  
8 ~~cushioning media does not escape from a puncture on said~~  
9 ~~cushioning element.~~

71

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10 71. A cushion as recited in claim 75, wherein a cross  
11 section of one of said columns taken orthogonal to said  
12 longitudinal axis of said column has a shape selected from the  
13 group consisting of triangular, square, rectangular, pentagonal,  
14 heptagonal, octagonal, round, oval, and n-sided polygonal where n  
15 is an integer.

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16 73. A cushion as recited in claim 72, wherein a cross  
17 section of one of said columns taken orthogonal to said  
18 longitudinal axis of said column has a hexagonal shape.

19  
20 82. A cushion as recited in claim 72 wherein said  
21 cushioning element has shape memory so that when a cushioned

1 object is removed from contact with the cushioning element, the  
2 cushioning element has a tendency to return to a shape that  
3 approximates the shape of the cushioning element before the  
4 cushioning element and the cushioned object came into contact  
5 with each other.

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§ 6 83. A cushion as recited in claim ~~72~~ 66 wherein said gel  
7 cushioning element is configured to have a low overall thermal  
8 mass and a low overall rate of thermal transfer in order to  
9 provide a comfortable cushioning element.

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§ 10 84. A cushion as recited in claim ~~72~~ 66 wherein said periphery  
11 of the cushioning element has a shape selected from the group  
12 consisting of triangular, square, rectangular, pentagonal,  
13 hexagonal, heptagonal, octagonal, round, oval, elliptical, heart-  
14 shaped, and n-sided polygonal.

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§ 15 85. A cushion as recited in claim ~~72~~ 66 wherein said  
16 cushioning media includes a quantity of gas bubbles within it,  
17 said gas bubbles serving to enhance the compressibility of the  
18 cushioning element.

77  
19 86. A cushion as recited in claim ~~85~~ 76 wherein said gas  
20 bubbles are dispersed throughout said cushioning media of the  
21 cushioning element.

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1 ~~87.~~ A cushion as recited in claim ~~85~~ wherein a plurality of  
2 said gas bubbles are present in said column walls, said gas  
3 bubbles in said column walls serving to decrease the level of  
4 compressive force required to be exerted on a column in order to  
5 cause the column to buckle.

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B 6 ~~88.~~ A cushion as recited in claim ~~72~~ wherein a plurality of  
7 said column walls have openings in them to permit movement of a  
8 liquid or gas between adjacent columns.

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27 66

B 9 ~~89.~~ A cushion as recited in claim ~~72~~ wherein at least one  
10 of said columns has a column interior that has a greater radial  
11 measurement orthogonal to the longitudinal axis of that column at  
12 a first point on the longitudinal axis of the column than at a  
13 second point on said longitudinal axis.

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14 ~~90.~~ A cushion as recited in claim ~~89~~ wherein said column is  
15 tapered between said column top and said column bottom.

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16 ~~91.~~ A cushion as recited in claim ~~89~~ wherein said column is  
17 stepped between said column top and said column bottom.

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B 18 ~~92.~~ A cushion as recited in claim ~~72~~ wherein in at least  
19 one column, said column top and said column bottom are sealed so

1 that said column interior is not in fluid or air communication  
2 with a region outside of said column interior.

3 <sup>84</sup>  
~~93~~. A cushion as recited in claim <sup>83</sup>~~92~~ wherein said column  
4 interior includes a quantity of fluid cushioning media within it.

5 <sup>85</sup>  
~~94~~. A cushion as recited in claim <sup>86</sup>~~72~~ wherein at least one  
6 of said columns has a column interior that contains a quantity of  
7 foam within it, said foam being selected from the group  
8 consisting of open cell foam and closed cell foam.

9 <sup>86</sup>  
~~95~~. A cushion as recited in claim <sup>86</sup>~~72~~ wherein at least one  
10 of said columns has a firmness protrusion located at its column  
11 bottom, said firmness protrusion being adapted to provide support  
12 within said column when said column buckles so that the  
13 cushioning element can readily yield in the vicinity of said  
14 column under a cushioned object until the cushioned object begins  
15 to compress said firmness protrusion, whereupon said firmness  
16 protrusion retards further movement of the cushioned object into  
17 the cushioning element.

18 <sup>87</sup>  
~~96~~. A cushion as recited in claim <sup>86</sup>~~72~~ wherein at least one  
19 of said columns is adapted to buckle by having a portion of its  
20 column wall bulge outward away from the column interior.

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~~87~~.

A cushion as recited in claim ~~72~~ 66 wherein at least one of said columns is adapted to buckle by having a portion of its column wall bulge inward toward the column interior.

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~~88~~.

A cushion as recited in claim ~~72~~ 66 wherein at least one of said columns is adapted to yield along its longitudinal axis by buckling of its column wall.

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~~89~~.

A cushion as recited in claim ~~72~~ 66, wherein the cushioning element has a total volume contained within the boundaries of the cushioning element top, bottom and outer periphery; and wherein said cushioning element total volume is occupied by not more than about 50% by volume of cushioning media.

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~~90~~.

A cushion as recited in claim ~~72~~ 66 wherein said gel cushioning media is selected from the group consisting of elastomers and viscoelastomers.

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~~91~~.

A cushion as recited in claim ~~72~~ 66 wherein said gel cushioning media has a Shore A hardness of less than 15.

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~~92~~.

A cushion as recited in claim ~~72~~ 66 wherein said gel cushioning media has a Shore A hardness of less than 3.

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1 ~~103~~. A cushion as recited in claim ~~72~~ wherein said gel  
2 cushioning media has a gram Bloom of less than 700.

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3 ~~104~~. A cushion as recited in claim ~~72~~ wherein said gel  
4 cushioning media comprises a high viscosity triblock copolymer.

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5 ~~105~~. A cushion as recited in claim ~~104~~ wherein said  
6 copolymer has the general configuration of poly(styrene-ethylene-  
7 butylene-styrene).

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8 ~~106~~. A cushion as recited in claim ~~72~~ wherein said gel  
9 cushioning media comprises about 100 parts by weight of a  
10 triblock copolymer and from about 200 to about 1600 parts by  
11 weight of a plasticizing oil.

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12 ~~107~~. A cushion as recited in claim ~~106~~ wherein said  
13 copolymer has the general configuration of poly(styrene-ethylene-  
14 butylene-styrene).

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15 ~~108~~. ~~A yieldable cushion comprising:~~

16 a cushioning element having a top, a bottom, a center and a  
17 side wall, said cushioning element comprising a quantity of  
18 gelatinous cushioning media and a plurality of columns located  
19 within said cushioning media, said columns each having  
20 longitudinal axis, a column interior and a column wall,

1 a base configured to be placed in contact with said cushioning  
2 element bottom, said base providing support beneath said  
3 cushioning element when a cushioned object is in contact with the  
4 cushion such that a compressive force is exerted against said  
5 cushioning element top by the cushioned object, and

6 a cover adapted to cover and protect said cushioning element;

7 wherein said cushion is yieldable in response to a compressive  
8 force exerted upon it by a cushioned object; and

9 wherein said yieldability of the cushion results from said  
10 cushioning media being compressible and from said columns being  
11 bucklable in the direction of their longitudinal axes, so that  
12 the cushion is able to substantially conform to the shape of a  
13 cushioned object.

14 <sup>100</sup>~~109~~. A cushion as recited in claim <sup>99</sup>~~108~~ wherein said cover is  
15 an elastic cover that permits air flow between said cushioning  
16 element top and a cushioned object adjacent thereto.

17 <sup>101</sup>~~110~~. A cushion as recited in claim <sup>99</sup>~~108~~ further comprising:  
18 a side wall support, said side wall support being configured to  
19 tend to constrain said side wall of said cushioning element from  
20 moving in an outward direction.



102

99

1 ~~111~~. A cushion as recited in claim ~~108~~ wherein said sidewall  
 2 support is a rigid plate adapted to be placed between said cover  
 3 and said cushioning element.

103

112. <sup>as</sup> ~~A yieldable cushion comprising:~~

5 a cushioning element having a top, a bottom, a center and an  
 6 outer periphery, said cushioning element comprising a quantity of  
 7 gelatinous cushioning media and a plurality of columns located  
 8 within said cushioning media, said columns each having a  
 9 longitudinal axis, a column interior and a column wall, and  
 10 a girdle placeable about said outer periphery of said  
 11 cushioning element, said girdle serving to retard movement of  
 12 said outer periphery when a cushioned object exerts a compressive  
 13 force on the cushioning element,

14 wherein said cushion is yieldable in response to a compressive  
 15 force exerted upon it by a cushioned object; and

16 wherein said yieldability of the cushion results from said  
 17 cushioning media being compressible and from said columns being  
 18 bucklable generally in the direction of their longitudinal axes,  
 19 so that the cushion is able to substantially conform to the shape  
 20 of a cushioned object.

104

103

21 ~~113~~. A cushion as recited in claim ~~112~~ wherein said girdle  
 22 is a strap.

105

114.

~~A yieldable cushioning element comprising:~~

a quantity of gel cushioning media formed to have a top, a bottom, and an outer periphery, the cushioning media being compressible so that it will deform under the compressive force of a cushioned object, and

a plurality of hollow columns situated in said cushioning media, each of said columns having a longitudinal axis along its length, each of said columns having a column wall which defines a column interior, and each of said columns having a column top and a column bottom;

wherein the cushioning element is adapted to have a cushioned object placed in contact with said cushioning element top;

wherein the column top and the column bottom of one of said columns are located at two different points on said longitudinal axis of said column;

wherein said column's longitudinal axis is located generally parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said column top;

wherein at least one of said columns is capable of buckling beneath a protuberance that is located on a cushioned object;

wherein the cushioning element is yieldable as a result of compressibility of said cushioning media and bucklability of said column;

1 wherein said cushioning media comprises thermoplastic, heat  
2 formable and heat reversible gelatinous elastomer composition, G,  
3 which is physically interlocked with a selected material Mn, said  
4 gelatinous elastomer composition formed from (a) 100 parts by  
5 weight of a high viscosity triblock copolymer of the general  
6 configuration poly(styrene-ethylene-butylene-styrene); (b) from  
7 about 200 to about 1,600 parts by weight of a plasticizing oil;  
8 said composition characterized by a gel rigidity of from about 20  
9 to about 800 gram Bloom; said composition formed from the  
10 combination GnMnGn, MnGnMn, MnGnGn, GnGnMn, MnGnGnMn, GnMnGnGn,  
11 GnMnMnGn, GnMnMnGn, GnGnMnMn, GnGnMnGnMn, GnMnGnGn, GnGnMn,  
12 GnMnGnMnMn, MnGnMnGnMnGn, GnGnMnMnGn, or GnGnMnGnMnGn, wherein  
13 when n is a subscript of M, n is selected from the group  
14 consisting of foam, plastic, fabric, metal, concrete, wood,  
15 glass, ceramics, synthetic resin, synthetic fibers or refractory  
16 materials; and

17 wherein when n is a subscript of G, n denotes the same or a  
18 different gel rigidity.

19 <sup>106</sup>  
20 ~~115~~. A cushioning element as recited in claim <sup>105</sup>~~114~~ wherein  
21 said styrene end block to ethylene and butylene center block  
22 ratio is from about 20:80 to about 40:60.

23 <sup>107</sup>  
24 ~~116~~. A cushioning element as recited in claim <sup>105</sup>~~114~~, wherein  
25 said triblock copolymer is characterized by a Brookfield

Viscosity of a 20 weight percent solids solution in toluene at 25° C. of substantially greater than 1,800 cps.

<sup>108</sup>  
~~112~~. A cushioning element as recited in claim <sup>105</sup>~~114~~ wherein said cushioning media is a gelatinous elastomer composition comprising:

(a) about 100 parts by weight of a triblock copolymer of the general configuration poly(styrene-ethylene-butylene-styrene) wherein said styrene end block to ethylene and butylene center block ratio is within the range of from between 31:69 to 40:60;

(b) from about 200 to about 1,600 parts by weight of an plasticizing oil selected from the group consisting of petroleum paraffinic oils, petroleum naphthenic oils, synthetic polybutene oils, synthetic polypropene oils, synthetic polyterpene oils and mixtures thereof; said oils having an average molecular weight of between about 200 to about 800; and

(c) said gelatinous elastomer composition being characterized as having an elongation at break of at least about 1,600%, an ultimate tensile strength of at least about  $8 \times 10^5$  dyne/cm<sup>2</sup>, and a gel rigidity of substantially not greater than about 800 gram Bloom.

<sup>109</sup>  
~~118~~. A cushioning element as recited in claim <sup>108</sup>~~117~~ wherein said cushioning media exhibits the following properties:

1 (a) tensile strength of about  $8 \times 10^5$  dyne/cm<sup>2</sup> to about  $10^7$   
2 dyne/cm<sup>2</sup> as measured with crosshead separation speed of 25 cm per  
3 minute at 23° C.;

4 (b) elongation of about 1,600% to about 3,000% as measured  
5 with crosshead separation speed of 25 cm per minute at 23° C.;

6 (c) elasticity modulus of about  $10^4$  dyne/cm<sup>2</sup> to about  $10^6$   
7 dyne/cm<sup>2</sup> as measured with crosshead separation speed of 25 cm per  
8 minute at 23° C.;

9 (d) shear modulus of about  $10^4$  dyne/cm<sup>2</sup> to about  $10^6$  dyne/cm<sup>2</sup>  
10 as measured with a 1, 2, and 3 kilogram load at 23° C.;

11 (e) gel rigidity of about 20 gram Bloom to about 800 gram  
12 Bloom as measured by the gram weight required to depress a gel a  
13 distance of 4 mm with a piston having a cross-sectional area of 1  
14 square cm at 23° C.;

15 (f) tear propagation resistance of at least  $5 \times 10^5$  dyne/cm<sup>2</sup>  
16 as measured at a crosshead separation speed of 25 cm/minute at  
17 23° C.;

18 (g) and substantially 100% snap back recovery when extended at  
19 a crosshead separation speed of 25 cm/minute to 1,200% at 23° C.

20 <sup>110</sup>  
~~119~~ A cushioning element as recited in claim <sup>105</sup>~~114~~ wherein  
21 said cushioning media is a gelatinous elastomer composition  
22 consisting essentially of:

23 (a) about 100 parts by weight of a triblock copolymer of the  
24 general configuration poly(styrene-ethylene-butylene-styrene)

wherein said styrene end block to ethylene and butylene center block ratio is about 32:68 to about 38:62;

(b) from about 200 to about 1,600 parts by weight of an plasticizing oil selected from the group consisting of petroleum paraffinic oils, petroleumnaphthenic oils, synthetic polybutene oils, synthetic polypropene oils, synthetic polyterpene oils and mixtures thereof; said oils having an average molecular weight of between about 200 to about 800; and

(c) said gelatinous elastomer composition being characterized as having an elongation at break of at least about 1,600%, an ultimate tensile strength of at least about  $8 \times 10^5$  dyne/cm<sup>2</sup>, and a gel rigidity of substantially not greater than about 800 gram Bloom.

111 110  
~~120~~. A cushioning element as recited in claim ~~419~~ wherein said cushioning media is a gelatinous elastomer composition comprising:

(a) about 100 parts by weight of a triblock copolymer of the general configuration poly(styrene-ethylene-butylene-styrene) wherein said styrene end block to ethylene and butylene center block ratio is about 32:68 to about 36:64;

(b) from about 200 to about 1,600 parts by weight of an plasticizing oil selected from the group consisting of petroleum paraffinic oils, petroleum naphthenic oils, synthetic polybutene oils, synthetic polypropene oils, synthetic polyterpene oils and

1 mixtures thereof; said oils having an average molecular weight of  
2 between about 200 to about 800; and

3 (c) said gelatinous elastomer composition being characterized  
4 as having an elongation at break of at least about 1,600%, an  
5 ultimate tensile strength of at least about  $8 \times 10^5$  dyne/cm<sup>2</sup> ,  
6 and a gel rigidity of substantially not greater than about 800  
7 gram Bloom.

8 <sup>112</sup>  
9 ~~121~~. A cushioning element as recited in claim <sup>111</sup>~~120~~, said  
10 cushioning media being a gelatinous elastomer composition  
11 comprising:

12 (a) about 100 parts by weight of triblock copolymer of the  
13 general configuration poly(styrene-ethylene-butylene-styrene)  
14 wherein said styrene end block to ethylene and butylene center  
15 block ratio is within the range of from between 31:69 to 40:60;

16 (b) from about 200 to about 1,600 parts by weight of a  
17 plasticizing oil;

18 (c) said gelatinous elastomer composition having a gel  
19 rigidity of about 20 gram to about 800 gram Bloom.

20 <sup>113</sup>  
21 ~~122~~. A cushioning element as recited in claim <sup>112</sup>~~121~~ wherein  
22 said plasticizing oil is selected from the group consisting of  
23 petroleum paraffinic oils, petroleum naphthenic oils, and  
24 mixtures thereof.

114

1 ~~123~~. A cushioning element as recited in claim ~~121~~<sup>112</sup> wherein  
2 said plasticizing oil is selected from the group consisting of  
3 synthetic polybutene oils, synthetic polypropene oils, synthetic  
4 polyterpene oils and mixtures thereof.

115

5  
6 ~~124~~. A cushioning element as recited in claim ~~121~~<sup>112</sup> wherein  
7 said plasticizing oil is selected from the group consisting of  
8 petroleum paraffinic oils, petroleum naphthenic oils, synthetic  
9 polybutene oils, synthetic polypropylene oils, synthetic  
10 polyterpene oils and mixtures thereof; said oils having an  
11 average molecular weight of between about 200 to about 800.

116

12  
13 ~~125~~. A cushioning element as recited in claim ~~121~~<sup>112</sup> wherein  
14 said oils having an average molecular weight of between about 200  
15 to about 800.

117

16  
17 ~~126~~. A cushioning element as recited in claim ~~121~~<sup>112</sup> wherein  
18 said cushioning element exhibits high creep, craze, tear, and  
19 crack resistance and is substantially free from oil bleedout.

118

20 ~~127. A yieldable cushioning element comprising:~~

21 a quantity of gel cushioning media formed to have a top, a  
22 bottom, and an outer periphery, the cushioning media being  
23 compressible so that it will deform under the compressive force  
24 of a cushioned object, and



1 a plurality of hollow columns situated in said cushioning  
2 media, each of said columns having a longitudinal axis along its  
3 length, each of said columns having a column wall which defines a  
4 column interior, and each of said columns having a column top and  
5 a column bottom;

6 wherein the cushioning element is adapted to have a cushioned  
7 object placed in contact with said cushioning element top;

8 wherein the column top and the column bottom of one of said  
9 columns are located at two different points on said longitudinal  
10 axis of said column;

11 wherein said column's longitudinal axis is located generally  
12 parallel to the direction of a compressive force exerted on the  
13 cushioning element by a cushioned object in contact with said  
14 column top;

15 wherein at least one of said columns is capable of buckling  
16 beneath a protuberance that is located on a cushioned object;

17 wherein the cushioning element is yieldable as a result of  
18 compressibility of said cushioning media and bucklability of said  
19 column;

20 wherein the cushioning media is a gelatinous elastomer  
21 composition comprising:

22 (a) about 100 parts by weight of a high viscosity triblock  
23 copolymer of the general configuration  
24 poly(styrene-ethylene-butylene-styrene);

1 (b) from about 200 to about 1,600 parts by weight of a  
2 plasticizing oil; said composition characterized by a gel  
3 rigidity of from about 20 to about 800 gram Bloom.

4 119  
5 128. <sup>a10</sup> ~~A yieldable cushioning element comprising:~~

6 a quantity of gel cushioning media formed to have a top, a  
7 bottom, and an outer periphery, the cushioning media being  
8 compressible so that it will deform under the compressive force  
9 of a cushioned object, and

10 a plurality of hollow columns situated in said cushioning  
11 media, each of said columns having a longitudinal axis along its  
12 length, each of said columns having a column wall which defines a  
13 column interior, and each of said columns having a column top and  
14 a column bottom;

15 wherein the cushioning element is adapted to have a cushioned  
16 object placed in contact with said cushioning element top;

17 wherein the column top and the column bottom of one of said  
18 columns are located at two different points on said longitudinal  
19 axis of said column;

20 wherein said column's longitudinal axis is located generally  
21 parallel to the direction of a compressive force exerted on the  
22 cushioning element by a cushioned object in contact with said  
23 column top;

24 wherein at least one of said columns is capable of buckling  
25 beneath a protuberance that is located on a cushioned object;

1 wherein the cushioning element is yieldable as a result of  
2 compressibility of said cushioning media and bucklability of said  
3 column;

4 wherein the cushioning media is a gelatinous elastomer  
5 composition comprising:

6 (a) about 100 parts by weight of a high viscosity triblock  
7 copolymer of the general configuration  
8 poly(styrene-ethylene-butylene-styrene); said styrene to ethylene  
9 and butylene is of a ratio of from about 20:80 to about 40:60;  
10 and

11 (b) from about 200 to about 1,600 parts by weight of a  
12 plasticizing oil; said composition characterized by a gel  
13 rigidity of from about 20 to about 800 gram Bloom.

14 <sup>120</sup>~~129~~. A cushioning element as recited in claim <sup>119</sup>~~128~~ wherein  
15 said triblock copolymer is characterized by a Brookfield  
16 Viscosity of a 20 weight percent solids solution in toluene at  
17 25° C. of at least about 1,800 cps.